redeemed a long strip of the map of Tibet along the parallel of 36° N. from absolute blankness. Leaving Khotan with a large caravan of horses, donkeys and camels in June 1896, Dr. Hedin proceeded eastward, skirting the desert to Kopa, then turning south-west into unknown country across the west end of the Altyn-tagh, he crossed the parallel range of the Arka-tagh (close to the place where Littledale crossed it going south), and marched eastward for twenty-six days along a great elevated region averaging nearly 16,000 feet in height, with the Arka-tagh bordering it to the north, and another snowy range, the Kokoshili, to the south. This is spoken of as a "latitudinal valley," or as a valley bordered by "latitudinal mountain ranges," but the sense of the term is not clear, the expression *longitudinal valley* would appear to be the correct one, as it seems to be a vast trough between parallel mountain ridges. The centre of the trough is occupied by a succession of small basins, each an independent centre of drainage, and each containing a long narrow salt lake lying east and west. It is really a land-surface in the making. If the precipitation had been heavy enough to fill these basins and start rivers flowing from one to another, the whole valley would now be drained by a great axial river; but in default of river erosion the basins remain untapped, and wind and frost alone are fashioning their peculiar topography. A little yellow grass was found in patches in the basins, on which vast herds of wild asses and wild yaks were feeding; but for fifty-five days no human being or human habitation was seen. We look forward with much interest to the detailed description of this interesting region, the map of which, prepared in Sweden, is obviously only provisional, and not accurate; for instance, the distance between camps xxii. and xxiii., said in the text to be the longest day's journey, is represented as very nearly the shortest, and the position assigned to the camps does not fit the description. At length, on October 1, 1896, Mongols were met, and a descent made from the Tibet plateau to the Tsaidam swamps, whence the route lay over known ground to Peking, and thence Dr. Hedin returned to Sweden across Mongolia, Siberia and Russia.

When one contemplates such a journey, so brightly and popularly told, full of adventure, hardships and solitude, yet every hour of it occupied in collecting, observing, note-taking and map-making, and when one remembers that only German training can make such work possible at present, even to the most adventurous and persevering traveller, it is impossible not to be struck from another side by Sir John Murray's feeling, expressed in his recent appeal for Antarctic exploration:—

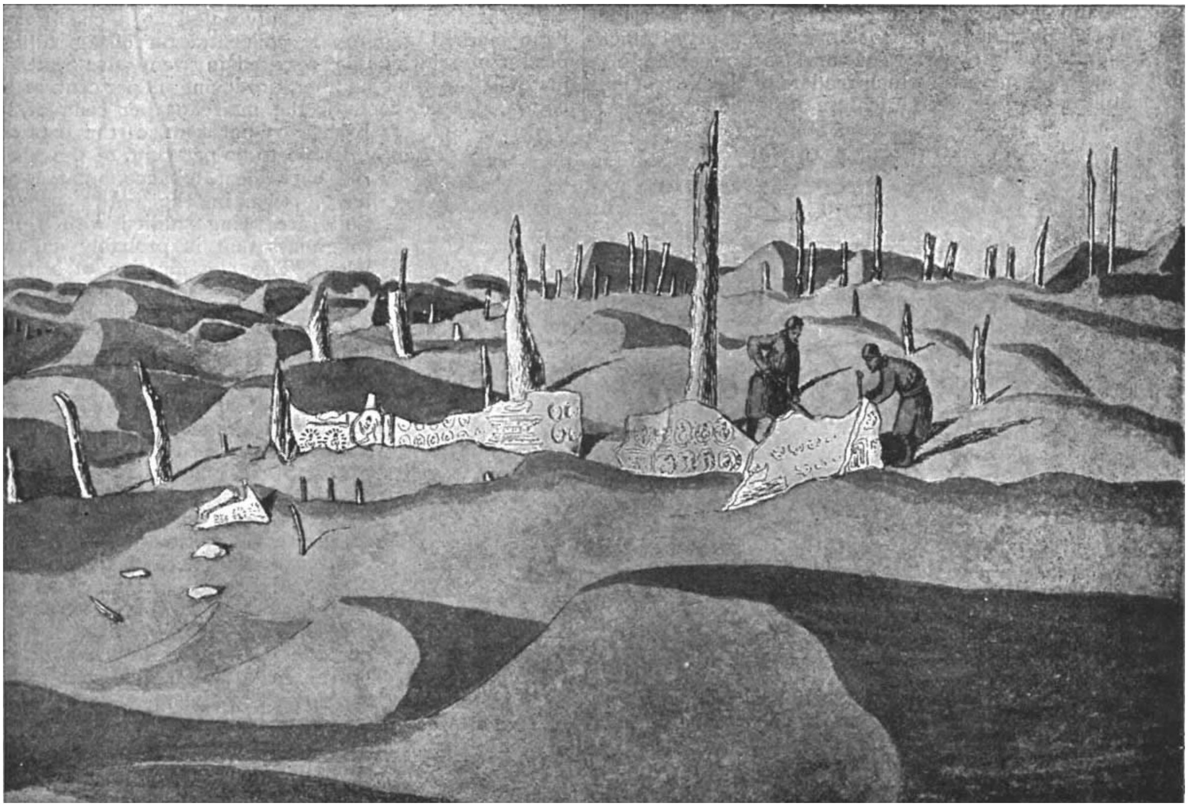

FIG. 1.—The ruins of Takla-makan east of the Keriya-daria.

"The conviction that we are, in exploration and scientific research, not doing anything like our best, is much deepened when we compare our present efforts with what is being done in these directions by other progressive nations." HUGH ROBERT MILL.

THE AMERICAN AGRICULTURAL YEAR-BOOK.[1]

YEAR by year the official volume issued by the Department of Agriculture at Washington appears to increase in interest and importance, and the latest addition to the series is well-nigh bewildering in the scope and variety of its contents. Making every allowance for the fact that the functions of the United States Minister of Agriculture extend over an area practically as large as that of Europe, and for the circumstance that much of the agricultural practice of the western hemisphere is still in the tentative stage, the volume is nevertheless impressive on account of its encyclopaedic character. Precedence is given to the annual report of the Secretary, who is the political head of the Department, his position being comparable with that of the President of the Board of Agriculture in Great Britain. This document, of which a preliminary issue was made at the close of last year, occupies 50 pages, and deals comprehensively with the whole work of the Department. A section of 220 pages is next taken up by articles, nineteen in number, written by the heads of the several divisions of the Department, and setting forth the relation of the work of each division to the farming industry. This, we may remark, is a special feature of the current volume, and is the outcome of an express wish on the part of the Secretary, who took over the reins of office for the first time last year. The third section, extending to 340 pages, is one with which readers of the Year-book are familiar, as it has been a feature of previous volumes. It consists, on this occasion, of a series of papers by acknowledged authorities on such subjects as the fruit industry, birds that injure grain, lawns and lawn-making, utilisation of hybrids in plant-breeding, soil problems, seed testing, leguminous forage crops, danger of importing insect pests, and the utilisation of by-products of the dairy. An appendix of 140 pages is well filled with a variety of useful matter, mainly statistical; but we do not observe at p. 714, where the area under wheat in 1897 is given as 39,465,066 acres, any reference to the fact that this represents a deviation of nearly 5,000,000 acres form the true extent of surface thus occupied, the underestimate being apparently the result of an accumulation of errors for a series of years. Lastly, the volume is furnished with an admirable index of 32 pages, which adds greatly to its value as a work of reference.

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[1] "Year-book of the United States Department of Agriculture, 1897. Pp. 492; with 40 plain or coloured plates, and 45 figures in the text. (Washington: Government Printing Office, 1898.)

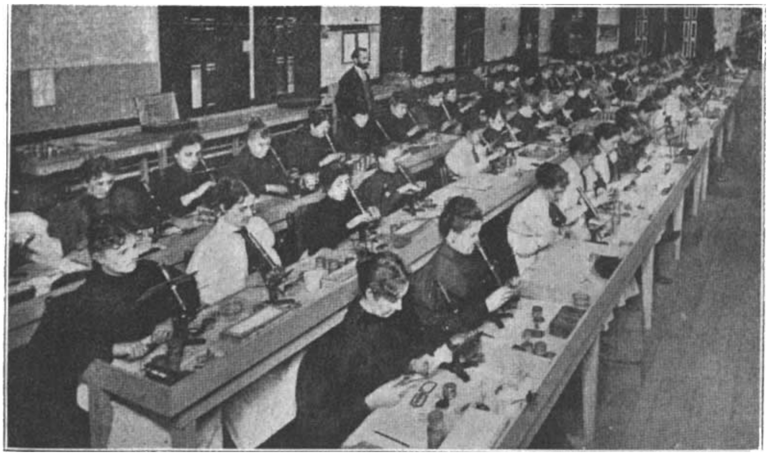

FIG. 1.

A few examples, selected at hazard from different parts of the year-book, will serve to indicate the nature and value of the information which it conveys. Attention has been bestowed upon the investigation of certain crops, the produce of which is largely imported, but which could probably be grown with profit in the United States. Chicory is a case in point; the whole of this material required for consumption has hitherto been imported, but it is believed that in the course of ten years the country will be growing enough to entirely meet the home demand. Ten years ago the United States imported annually about 130,000 dollars' worth of insect powder, but the experimental cultivation of pyrethrum in California proved a success, the result being that the import trade referred to has dwindled away. The loss in the United States from the diseases affecting cereal crops is estimated to amount to 25,000,000 dollars or 30,000,000 dollars annually. Cotton, tobacco, potatoes and other staple crops are correspondingly damaged. In one year the loss arising from diseases of orange, lemon and other citrus fruits was estimated at more than 450,000 dollars in Florida alone. From plant-diseases of all kinds the loss to the entire country is put at 150,000,000 dollars to 200,000,000 dollars annually. Against such calamities the work in the division of vegetable pathology is making steady progress, and significant examples are given of the benefit that has thus already accrued to the grape-grower, the nurseryman and the orchardist. The diversification of crops is advocated as a check upon "the marked geographic concentration of agricultural productions," which has resulted in twenty-five States, or just half the total number, producing 98 per cent. of the cotton, 95 per cent. of the maize, 95 per cent. of the barley, 93 per cent. of the oats, and from 80 to 90 per cent. of the wheat, rye, buckwheat, tobacco, potatoes and hay grown in the entire country. Soils are being studied with a thoroughness that is probably unparalleled. The classification of soils on a geological basis, their texture, their structure, and their relation to water, are receiving the fullest attention. With regard to the cause of the movement of water in soils, "it was understood that it was the contractile power of the film of water around the soil grains that caused the movement of water to the plant. It appears now, from a minute study of this problem, that the movement is dependent upon the curvature of this film rather than upon the total area of its surface." Many an English traveller on the western prairies has been struck by the seemingly harsh and innutritious herbage upon which cattle and horses nevertheless live and thrive. A discussion of the value as forage of so-called weeds permits a reference to various plants which are drought-resisting, or thrive on alkali lands, and are valuable as forage. They include white sage (*Artemisia* spp.), green sage (*Bigelovia* spp.), sweet sage or winter fat (*Eurotia lanata*), salt sage (*Atriplex* spp.), and grease wood (*Sarcobatus vermiculatus*). It is probable that these could be profitably grown under cultivation, and thus made to yield a much larger amount of forage than is now obtained. The contention that every farm is an experiment station cannot be controverted, and it would be advantageous to farmers in all countries were they more habituated to the regular use of the note-book. The cultivation of catch crops to maintain a supply of nitrogen in the soil, is a headline that cannot fail to attract the eye of English agriculturists. If catch-cropping is understood and intelligently practised anywhere, it is on the light arable lands of England, where the system may almost be said to have originated —at a time, moreover, when practice was in advance of science, for farmers had approved and adopted the system before the extension of our knowledge of the nitrogen problem had supplied the theoretical justification. The work of the chemical division with regard to the development of cane and beet, and other sugar-producing crops, has been fruitful in result. In the course of experimental work occupying eight years, the percentage of sugar in field crops of sorghum was raised from 9 to 14. The investigations concerned with beet cultivation have been so successful that the establishment of an indigenous sugar industry is now certain, and the benefit to American agriculture in the near future will be measured by hundreds of millions of dollars.

It would be instructive to refer to the work of the Weather Bureau, and of the divisions of entomology, agrostology and forestry; but it must suffice to conclude with a few observations on the bureau of animal industry.

Those who have been engaged in recent years in the administration of the Diseases of Animals Acts in Great Britain will best appreciate the comprehensiveness and the excellence of the work of the Washington Bureau. It is a bold statement to make, perhaps, that the whole of the United States territory—from the Atlantic to the Pacific, and from the great lakes to the Gulf of Mexico—has been swept free from pleuro-pneumonia; and those who are familiar with the history of this most troublesome disease in Great Britain will only hope that the assertion may prove to be true.

The microscopic inspection of pork intended for export is worthy of all praise, and we reproduce an illustration showing this work in progress. Last year 1,881,309 specimens were thus examined for trichinae, and only 13,325 were found infested; the cost of this inspection was 111,670 dollars.

EDWIN DUNKIN, F.R.S.

AT the ripe age of seventy-seven, with the consciousness of having fulfilled a useful career, and amid the respect and sympathy of his associates, Mr. Edwin Dunkin has passed away, again diminishing the small band of zealous assistants, that Sir George Airy collected around himself, when some sixty years ago he undertook the reorganisation of the Royal Observatory, and inaugurated that system of uniform and continual observation which has ever since remained the chief characteristic of that institution. To trace the career of Mr. Edwin Dunkin is to recall the history of the Observatory under its late director, for during nearly half a century Mr. Dunkin took a prominent part in its activity, filling many responsible positions, till finally he became the chief and confidential assistant. In whatever capacity he was placed he was admirably adapted to it by reason of his painstaking and accurate observation, his loyalty to his chief, and his keen interest in the science. It was his fortune to see and to assist in the creation and development of a magnetical and meteorological department, to witness the establishment of a system of extra meridional observations of the moon, to see the observations of Right Ascension and Zenith Distance effected by a single instrument, and to mark the substitution of chronographic registrations for the older method of recording transits. He remained at his post long enough to note the introduction of the spectroscope and of photographic processes: in a word, to form a link between the methods of the old astronomy of position and the purposes of the newer physical science. He lived to see the staff of the Observatory trebled and quadrupled, as fresh objects of inquiry were brought within its scope; and that he could adapt himself to every change, and lend his experience to ensure the smooth working of the ever-growing machinery, is to say that he was an able and useful official, rendering good work in his day and generation.

Naturally, from his official position, Mr. Dunkin took part in many of the scientific expeditions organised at the Royal Observatory under Government auspices. Among the earliest of these was a visit to Christiania to observe the total eclipse of the sun in 1852. The instrumental equipment provided, consisted of a telescope of 3½ inches aperture, mounted on a firm tripod, and provided with steadying rods. If this optical assistance appears to us now antiquated and inadequate, the observations made with it read even more strangely. We may quote one sentence from the official report, which illustrates the progress of physical inquiry accomplished within a single scientific life. Mr. Dunkin is describing his first impressions of a solar prominence:

"My eye was intently fixed upon it for about a minute of time, and during that interval not the slightest change took place in its form. Its colour was pink, or rose colour, but the shade was not very deep. It seemed to me at the time, from the excessive steadiness of this prominence, and from the fact that I had zealously watched it for so long an interval without its undergoing any change, that this object had some connection with the *moon*. However . . . it is possible I may be deceived."

Another classical experiment in which he was engaged, and to whose minute care the measure of success obtained was mainly due, had reference to the determination of gravity at different distances below the earth's surface, by means of pendulum experiments. Some thirty years previously, the late Astronomer Royal had carried out an investigation of the same nature, which had not led to a satisfactory termination; but in the case of the Harton Colliery, where experiments could be effectively made at a depth of 1260 feet, Sir George Airy expressed himself as quite satisfied with the result achieved, and considered that it established a favourable precedent for similar inquiries in the future. The result was to show an increase in the force of gravity of 1/19000 at the depth reached. Longitude determinations may be said to come almost within the daily routine of the Royal Observatory, and it would not be necessary to refer to the share Mr. Dunkin took in these, but for the fact that the system of telegraphic signals was a new and practically an untried method when Mr. Dunkin and M. Faye were engaged in the longitude determination of Paris. Doubtless there were difficulties in those days, which have been so effectually overcome that they have been forgotten; but as a pioneer, Mr. Dunkin, and those who were associated with him, must have exhibited a manipulative skill which we may now fail to appreciate.

We should do less than justice to Mr. Dunkin's memory if we did not recall his long and eminent services to the Royal Astronomical Society, which he served in various capacities. He was Secretary at the time of the removal of the Society's property from Somerset House to its present quarters, and the reorganisation of the library, and the restoration of order into the Society's affairs, which had fallen a little out of gear, devolved mainly upon him, but his methodical habits and unstinted devotion to the interests of the Society ensured complete success in the regularity and management. Among other services to the Society, one may mention the many obituary notices which it was his misfortune to have to write, but which were always recognised as just and appreciative, and not without literary merit. His scientific communications had generally some reference to points of importance in practical astronomy, such as the treatment of personal equation in observations, or the determination of proper motions of stars. He was eminently a practical astronomer, rendering useful, if less brilliant work than the mathematician; but the many solitary hours he passed at the eye-piece of the transit circle, or the altazimuth, will not be without their due effect in advancing the interests of astronomical science.

W. E. P.